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Monitoring chronic diseases in Canada: the Chronic Disease Indicator Framework

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Abstract

Introduction: The Public Health Agency of Canada developed the *Chronic Disease Indicator Framework* (the Framework) with the goal of systematizing and enhancing chronic disease surveillance in Canada by providing the basis for consistent and reliable information on chronic diseases and their determinants.

Methods: Available national and international health indicators, frameworks and national health databases were reviewed to identify potential indicators. To make sure that a comprehensive and balanced set of indicators relevant to chronic disease prevention was included, a conceptual model with "core domains" for grouping eligible indicators was developed. Specific selection criteria were applied to identify key measures. Extensive consultations with a broad range of government partners, non-governmental organizations and public health practitioners were conducted to reach consensus and refine and validate the Framework.

Results: The Framework contains 41 indicators organized in a model comprised of 6 core domains: social and environmental determinants, early life / childhood risk and protective factors, behavioural risk and protective factors, risk conditions, disease prevention practices, and health outcomes/status. Also planned is an annual release of updated data on the proposed set of indicators, including national estimates, breakdowns by demographic and socioeconomic variables, and time trends.

Conclusions: Understanding the evidence related to chronic diseases and their determinants is key to interpreting trends and crucial to the development of public health interventions. The Framework and its related products have the potential of becoming an indispensable tool for evidence-informed decision making in Canada.

Introduction

Chronic diseases such as diabetes, cancer, arthritis, mental illness, and cardiovascular and chronic respiratory diseases are major contributors to reduced quality of life, loss of productivity, and increased hospitalization and health care costs as well as premature death in Canada.[1] Out of every 5 Canadians aged 20 years or older, 3 have a chronic disease and 4 are at risk of developing a chronic condition.[2]

The importance of identifying and addressing the risk factors and determinants of chronic disease has long been recognized as central to the prevention of chronic disease.[3] Understanding the evidence surrounding chronic diseases and their determinants is key to interpreting trends and crucial to developing public health interventions that can effectively reduce rates of chronic disease and improve the population's health and quality of life.

Since its inception in 2005, the Public Health Agency of Canada (the Agency) has collaborated with provincial and territorial ministries of health to develop and implement several pan-Canadian chronic disease strategies, policies and programs aimed at reducing and preventing chronic diseases. The many chronic disease risk and protective factors that accumulate over the life course have been central to these strategies, most notably the 2005 Integrated Pan-Canadian Healthy Living Strategy,[4] endorsed by Canada's federal, provincial and territorial Ministers of Health and Health Promotion/Healthy Living.

Given the need for an evidence base to inform policy and programmatic decision making and the move towards an integrated approach to chronic disease prevention, the Agency identified a requirement for a comprehensive approach to surveillance and reporting on chronic diseases and their associated determinants. An in-depth environmental scan revealed the absence of an appropriate national indicator framework (or set of indicators) to meet the Agency's needs. Some frameworks, such as the joint Canadian Institute for Health Information–Statistics Canada Health Indicators Framework,[5] emphasize areas beyond the scope of chronic disease surveillance (e.g. a portion of the Health Indicators Framework is devoted to "health system performance" and "community and health system characteristics," which encompass areas broader than chronic disease surveillance). Others took a more narrow or detailed focus on a specific condition or stage of life.[6–8]

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As a result, the Agency undertook the development of a new indicator framework that focuses on integrated chronic disease surveillance.

This report describes the approach taken to develop the *Chronic Disease Indicator Framework* (the Framework). This approach began with identifying the guiding principles for the Framework and developing a conceptual model upon which to group indicators to make sure the scope of the final Framework met Agency needs. The approach concluded with broad consultations with content/science experts and policy/program decision makers who are the Framework's key intended audience.

This report also presents current and potential applications of the Framework that guide effective public health action to prevent chronic disease in Canada.

Identifying the Framework's audience

The rationale for developing the Framework was the need to provide timely and easily accessible information about trends in chronic disease that decision makers could use to

- identify key areas on which to focus preventative measures and develop health policies and strategies, and
- increase public and stakeholder understanding of the health of the population and the factors that affect it.

Public health policy analysts and practitioners involved in chronic disease prevention at the federal, provincial and territorial levels were identified as the primary users of the data generated from the Framework. Understanding the information needs of these groups was therefore critical to the development of the Framework and the selection of relevant indicators. These indicators may also be used by other programs and jurisdictions for, among other reasons, comparison.

Guiding principles

The Framework's 4 guiding principles prioritize prevention of chronic diseases and emphasize the need to better address common risk factors that lead to chronic diseases and disease burdens across populations. These principles are intended to both guide the selection of and reporting on indicators.

Life course approach

Health care practitioners are identifying chronic diseases and risk factors among younger and younger Canadian populations, which makes the selection of indicators that capture this emerging trend very important.[9–11] As a result, the Framework incorporates indicators for the various stages of life, from before birth and through early childhood and adolescence to the end of life (see Figure 1).[12,13]

Disease prevention

With a renewed focus on prevention, the Agency needed to move beyond reporting on single diseases towards a more comprehensive approach that takes into account the broader determinants of health as well as the risk factors and biological markers that contribute to the development of a variety of chronic diseases.

Health equity approach

The burden of chronic disease is not distributed evenly across the population and certain groups of Canadians face higher rates of chronic disease and poorer health. In general, people in less advantageous socioeconomic circumstances (e.g. lower income, poor working conditions, poor social support, etc.) are less healthy than those at a higher socioeconomic status. Understanding the differences in health between population groups is critical to developing programs and policies that reduce these differences.

In order to identify disparity gradients with the population, the Framework selects and prioritizes those indicators that could be stratified as per the World Health Organization's recommendations for developing a "national health equity surveillance system."[14]

Multimorbidity

The burden of chronic diseases is not simply a sum of the impacts of each individual chronic disease, but often involves a complex interaction between several diseases, which presents additional challenges to Canadians. This concept of multimorbidity[15] is a critical public health issue and an independent predictor of adverse health outcomes, including decreased quality of life and increased health care costs, disability and premature mortality. As a result, the Agency incorporated the identification of relevant multimorbidity indicators as a key component of the Framework.

Structuring the Framework

There is no shortage of national or international health data, gathered using active (e.g. surveys) or passive (e.g. secondary use of administrative data) means, that can potentially be used to report on a wide range of areas that relate to the health of Canadians. Thus, the challenge in developing this Framework lay in identifying those measures that are the most important and relevant at providing an accurate picture of chronic disease in Canada and in ensuring alignment with other related frameworks.

To make sure that the Framework contains a comprehensive and balanced set of indicators that are relevant and key to chronic disease prevention, the Agency

- identified specific a priori *indicator selection criteria* (Table 1),
- developed a conceptual model with *core domains* into which indicators would be grouped (Table 2) and
- defined a prioritization process at the outset.

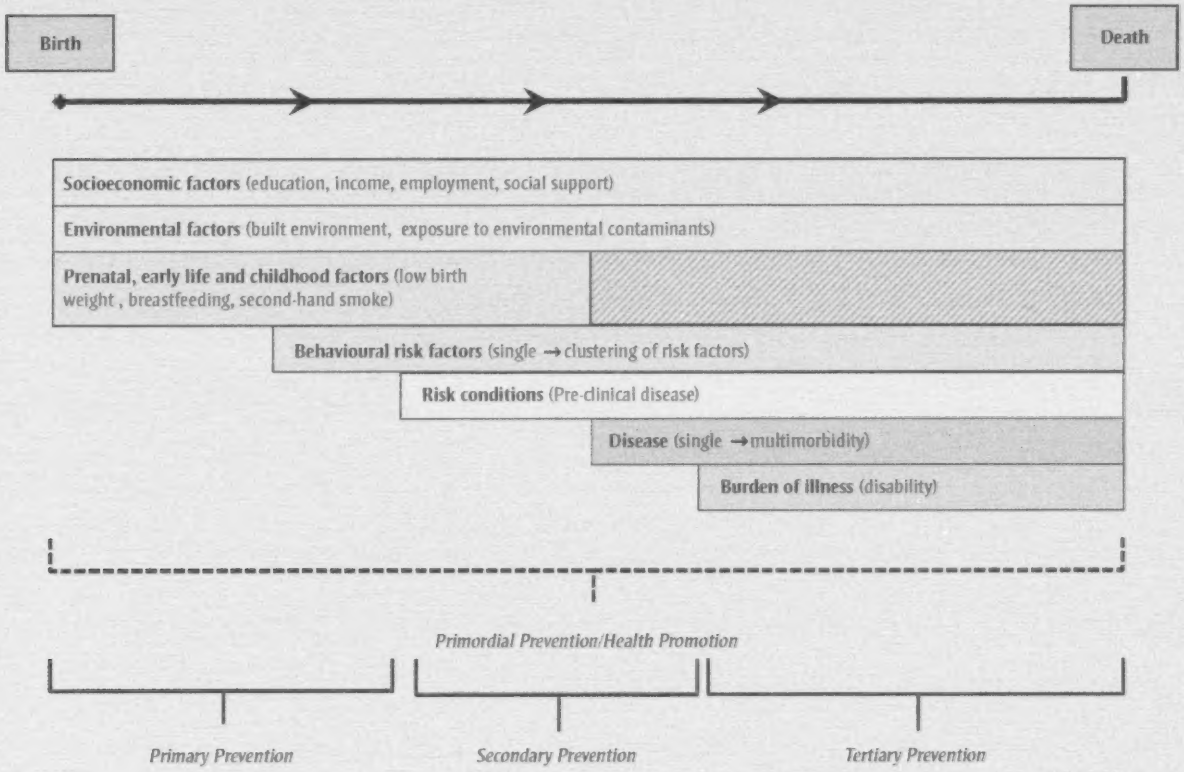
Indicator selection criteria

The criteria used to select indicators have been recommended in the literature and used by several national and international health indicator frameworks.[16–19] The indicator selection criteria are described in Table 1. Wherever possible, alignment with existing frameworks and routinely reported indicators was considered at every step of indicator selection.

Conceptual model core domains

The Agency identified 6 core domains (see Table 2) within which to group selected

FIGURE 1
Life-course Diagram


Birth
Death
Socioeconomic factors (education, income, employment, social support)
Environmental factors (built environment, exposure to environmental contaminants)
Prenatal, early life and childhood factors (low birth weight , breastfeeding, second-hand smoke)
Behavioural risk factors (single → clustering of risk factors)
Risk conditions (Pre-clinical disease)
Disease (single → multimorbidity)
Burden of illness (disability)
Primordial Prevention/Health Promotion
Primary Prevention
Secondary Prevention
Tertiary Prevention

indicators for the Framework. To ensure a balanced set of indicators within each of the 6 core domains, a minimum of 3 indicators needed to be identified for inclusion.

Populating the Framework

An extensive environmental scan of published reports and grey literature prepared by the Agency, and other Canadian[20–25] and international groups[26–30] plus a review of key national health databases (e.g. Canadian Chronic Disease Surveillance System, Canadian Community Health Survey) identified 283 indicator measures that had the potential to fit within the 6 core domains of the Framework. Two independent reviewers familiar with the national chronic disease surveillance system selected a subset of 130 indicator measures based on 2 of the 6 selection criteria ("relevant" to chronic disease and "amenable to change"). The 130 indicator measures were then narrowed down to 45 based on the input of a team of Agency chronic disease surveillance experts (i.e. public health professionals, epidemiol-

TABLE 1
Indicator selection criteria

Criteria	Description
Relevant	The indicator is clearly relevant to chronic disease prevention and control and/or is a *plausible proxy* for the underlying (i.e. gold standard) measure.
Accurate	Scientific soundness: The scientific evidence supporting a link between the performance of an indicator and chronic diseases is strong. Validity: The indicator appears reasonable as a measure of what it is intended to measure (face validity), and the components of the indicator make sense (construct validity). Reliability: The same results can be obtained if measurements are repeated under identical conditions.
Meaningful and useful	The information must be easy to understand, relevant for government plans and priorities and useful for public health action (e.g. targets population groups that are likely more affected).
Amenable to change	Provides information that can lead to action for change: inform and influence policy or funding, alter behaviour of health services providers, or increase general understanding in the community (e.g. improve behaviours, outcomes and health services utilization).
Feasible	Sufficiently good quality data are already available, or data collection can be put in place at a relatively low cost.
Ongoing	Data can be regularly collected and compared over time.

TABLE 2
Core domains and rationale

Domain	Rationale
Social and environmental determinants	Provide information on contextual factors and equity measures that influence health.
Early life / childhood risk and protective factors	Provide information on earliest risk and protective factors that are known to influence health outcomes across the life course and could be targeted through primordial[a] and primary[b] prevention efforts.
Behavioural risk and protective factors	Provide information on individual risk and protective behaviours that influence the likelihood of developing chronic diseases and that could be targeted through primordial and primary prevention.
Risk conditions	Provide information on intermediate risk factors associated with chronic disease that could be targeted through secondary prevention.[c]
Disease prevention practices	Provide information on disease screening and prevention practices used for secondary or tertiary[d] prevention of chronic diseases.
Health outcomes/status	Provide information on the magnitude and outcomes of chronic diseases and multimorbidity as well as the impact these outcomes have on quality of life, disability and premature death.

[a] Primordial prevention aims to prevent the establishment of social, economic, environmental and behavioural conditions that increase the risk of disease.

[b] Primary prevention aims to prevent disease from occurring by reducing exposure to risk.

[c] Secondary prevention aims to find and treat disease early in order to control it and prevent complications.

[d] Tertiary prevention aims to soften the impact of long-term disease and disability, minimize suffering and maximize potential years of useful life.

ogists and biostatisticians) via a modified Delphi process (i.e. ranking scales based on all 6 selection criteria and open discussions were used iteratively to reach consensus).

To make sure that the Framework identified measures that were comprehensive, evidence based, meaningful and relevant for program and policy decision makers at the federal level, several groups within both the Agency and Health Canada were consulted about the choice of the 45 indicators. From the feedback received, 3 additional indicator measures were incorporated into the Framework. The revised list of 48 indicators was then sent out to a broader range of government partners, non-governmental organizations and public health practitioners (75 people responding on behalf of 7 organizations plus some anonymous responses) for review based on the selection criteria (Table 1). From the feedback received, 2 additional indicator measures were incorporated into the Framework and 11 removed, leaving a list of 39 indicators.

Indicator measures suggested during both rounds of consultations that did not meet all 6 current selection criteria were recorded in a list for potential future consideration (e.g. air quality, social deprivation index, mental health index, sleep problems).

It is important to note that the entire indicator selection process was iterative. For example, while selecting indicators, the latest versions of some national and international indicators and health indicator frameworks were reviewed to make sure the Framework was complete as well as consistent with other frameworks. For example, measures of smoking were aligned with smoking indicators reported by Health Canada. The analysis process and data limitations also determined the addition of 2 new measures (i.e. an objective measure of physical activity for children and youth and a proxy measure for diabetes mortality – all-cause mortality rate ratios among people with and without diabetes). The final list of indicators for the Framework (Table 3) was refined based on extensive consultations with the intended target audiences using an iterative process. Of these 41 indicators, it is possible to report on 36 as 5—social support, physical environment, metabolic syndrome, clustering of risk factors and high blood pressure screening—are still being considered for future development (see Appendix A). For a detailed description of each indicator see Appendix B.

See Figure 2 for a flowchart of the indicator selection process.

Indicator-based reporting using the Framework

One of the primary objectives of the Framework is to ensure consistent reporting of statistics by the Agency and other key stakeholders. Access to this information is essential to achieving this objective. The type and scope of reporting products also matter. An annual release of the most recent data for each indicator contained within the Framework is being planned. Given variation in the frequency of data collection between data sources, not every indicator will be updated every year. However, the intent is to report annually on the proposed core set of indicators, which could inform of the existence of a predictable, comprehensive and publicly accessible source of information. This could potentially translate into an enhanced common understanding of the state of chronic diseases, their determinants and the knowledge gaps around them; this in turn, could lead to strategic, evidence-informed partnerships and program investment to reduce adverse health outcomes and health disparities.

In addition, while the Framework provides a routinely reported core list of indicators, it's anticipated that production of thematic outputs that identify emerging issues or trends, delve deeper into any of the 6 core domains and their interactions, and examine cross-cutting themes, such as multimorbidity, risk factor clusters health inequalities or specific populations such as children and youth.

TABLE 3
Indicator Framework

Core Domain[a]	Indicator Group	Indicator Measure(s)
Social and environmental determinants	Education	Percentage of population ≥ 20 years with less than high school education
	Income	Percentage of population living below low-income cut-offs, after tax
	Employment	Average annual unemployment rate (percentage of labour force ≥ 15 years unemployed during reference periods)
	Social support	(Social support availability)[b]
	Physical environment	(Built Environment Composite Index)[b]
Early life/childhood risk and protective factors	Birth weight	Percentage of live births with a low birth-weight
	Breastfeeding	Percentage of women ≥ 15 years who report exclusive breastfeeding of their child for at least the first 6 months
	Exposure to second-hand smoke	Percentage of households with children aged < 12 years regularly exposed to environmental tobacco smoke at home
Behavioural risk and protective factors	Smoking	Percentage of population ≥ 15 years who report being current smokers ("daily and occasional" and "daily")
	Physical activity	Percentage of children and youth aged 5–17 years who take at least 12 000 steps daily[c]
		Percentage of population ≥ 20 years who report being physically "active" or "moderately active" during their leisure time
	Sedentary behaviour	Percentage of population ≥ 12 years who spend > 14 hours/week watching television or using computers during leisure time
	Healthy eating	Percentage of population ≥ 12 years who report eating fruit and vegetables at least 5 times/day
	Unhealthy eating	Percentage of population 5–19 years who report drinking sugar-sweetened beverages daily
	Alcohol use	Percentage of population ≥ 15 years who exceed low-risk alcohol-drinking guidelines for chronic drinking
	Chronic stress	Percentage of population ≥ 12 years who report life to be "quite a bit" or "extremely" stressful most days in the last 12 months
	Clustering of risk factors	(Percentage of population with a combination of relevant modifiable risk factors)[b]
Risk conditions	Obesity	Percentage of children and youth 5–17 years and of adults ≥ 18 years who are obese[c]
	Elevated blood glucose	Percentage of population ≥ 20 years who have elevated blood glucose[c]
	Elevated blood pressure	Percentage of population ≥ 20 years who have elevated blood pressure[c]
	Elevated blood cholesterol	Percentage of population ≥ 20 years who have elevated blood cholesterol (ratio of total cholesterol to high-density lipoprotein)[c]
	Metabolic syndrome	(Percentage of population who exceed the cut points for 3 of 5 metabolic risk factors)[b]
Disease prevention practices (Secondary prevention)	Contact with health care professional	Percentage of population ≥ 12 years who report consulting a family physician or general practitioner at least once in the previous 12 months
		Percentage of population ≥ 12 years who report consulting a dentist, dental hygienist or orthodontist at least once in the past 12 months
	Disease screening	(Percentage of population who had at least 1 blood pressure measurement in the previous 2 years)[b]
		Percentage of women 50–74 years who report having a mammogram at least once in the previous 5 years
		Percentage of women 25–69 years who report having a Pap smear test at least once in the previous 3 years
		Percentage of population 50–74 years who report having at least 1 fecal occult blood test and/or colonoscopy and/or sigmoidoscopy in the recommended time period
	Vaccination (influenza)	Percentage of population ≥ 12 years living with a chronic health condition who report having a seasonal flu shot in the previous 12 months
Health outcomes / Status	General health	Percentage of population ≥ 12 years who rate their health as "very good" or "excellent"
		Percentage of population ≥ 12 years who rate their mental health as "very good" or "excellent"
		Life expectancy (at birth, at age 65 years)
		Health-adjusted life expectancy (at birth, at age 65 years)

Continued on the following page

TABLE 3 (continued)
Indicator Framework

Core Domain[a]	Indicator Group	Indicator Measure(s)
	Morbidity	Prevalence of major chronic diseases: cancer, diabetes, cardiovascular disease, chronic obstructive pulmonary disease
		Prevalence of specific chronic diseases: Diabetes, cardiovascular diseases, cancer, chronic respiratory diseases, musculoskeletal diseases, mental illness, neurodegenerative diseases (ADRD)
		Incidence rate of specific chronic diseases: diabetes, cardiovascular diseases, cancer, chronic respiratory diseases
	Multimorbidity	Percentage of population aged $\geq$ 20 years with multiple chronic conditions/diseases
	Disability	Percentage of population aged $\geq$ 12 years who report being limited in their activities "sometimes" or "often" due to disease/illness
	Mortality	Mortality rate due to major chronic diseases: cardiovascular diseases, all cancers, chronic respiratory disease Mortality rate due to specific chronic diseases: cardiovascular diseases, all cancers, chronic respiratory diseases, suicide
		All-cause mortality rate ratios among people with and without diabetes
		Potential years of life lost by cause of death: cardiovascular diseases, cancer, chronic respiratory diseases, suicide
		Unconditional probability of dying (%) between 30 and 69 years from the main chronic diseases: cardiovascular diseases, cancer, chronic respiratory diseases, diabetes[d]

Abbreviation: ADRD, Alzheimer Disease and Related Disorders.

[a] Data will be stratified and reported according to these demographic and socioeconomic variables, as per recommendations for developing a national health equity surveillance system[14]: age group, sex, at least 2 social markers (e.g. education, income, ethnicity, immigrant status), at least one regional marker (province/territory, rural/urban) and Aboriginal status, where possible.

[b] These measures are still under development and being considered among other identified data gaps.

[c] These measures are based on measured data.

[d] This indicator corresponds to the indicator of premature mortality adopted by the World Health Organization as a global target for the reduction of premature mortality due to non-communicable diseases.[31]

Applications of the Framework to guide effective public health action – current and planned

The Agency is committed to using the Framework to report on core indicators related to chronic diseases and their associated determinants. Similarly, several jurisdictions within Canada have expressed an interest in applying the Framework when collecting data to inform performance measures, responding to strategic planning processes, etc. Work with other jurisdictions is being facilitated by the Canadian Alliance on Regional Risk Factor Surveillance, a pan-Canadian network of public health practitioners. Internationally, as a World Health Organization Collaborating Centre on Non-Communicable Disease Policy, the Centre for Chronic Disease Prevention at the Agency is already using the Framework to inform the selection of indicators that will be used for monitoring and measuring chronic diseases and associated determinants worldwide. For example, the Framework was used to inform the completion of the World Health Organization's "Global Monitoring Framework"[30] and to determine and prioritize some of the main indicators of the Pan-American Health Organization's "Non-Communicable Disease Indicators and Targets," which are used to track mortality and assess progress in the prevention and control of non-communicable diseases internationally and in the Americas, respectively. As momentum for reporting using the Framework develops, consistent reporting on a core set of indicators will allow for comparisons of trends over time and across jurisdictions.

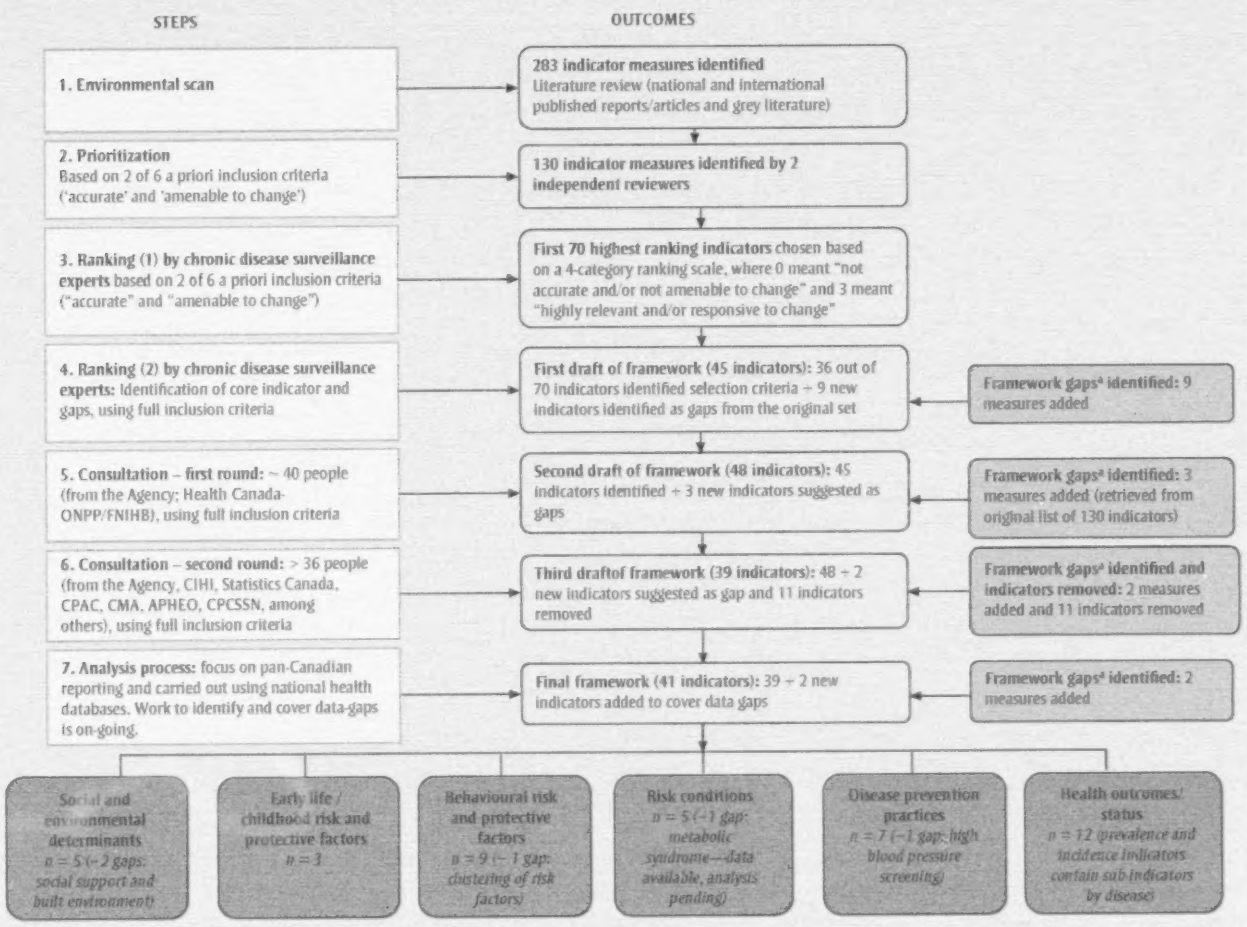
Given some gaps in indicators identified through the Framework development process, the Agency is working with Statistics Canada and other stakeholders to incorporate key questions from national population health surveys, which are among the main sources of data for chronic disease surveillance. Besides surveys, other innovative data collection tools could be also developed to provide objective measures in emerging or gap areas. The need to keep abreast of emerging evidence to inform new indicators or adjust existing ones will require innovative partnerships and the engagement of researchers. This, in turn, could strengthen Canada's contribution to understanding how best to address chronic disease prevention.

Limitations

The proposed set of core indicators is not without limitations. First, the scope of indicator selection was limited by the current availability of ongoing national data and/or feasibility for development of data that could be stratified by some socioeconomic variables. Second, some of the indicators proposed are currently not adequate to report on certain population groups (e.g. Aboriginal populations, immigrants) and the inclusion of some key populations (e.g. younger children under 5) is not adequately addressed through current national surveys. Therefore, additional work to encourage the gathering of data by expanding the scope of existing population health surveys or using innovative survey tools remains a priority.

Third, given the complexity of both proximal and distal factors that contribute to

FIGURE 2
Flow-chart of the Indicator Selection Process


STEPS
OUTCOMES
1. Environmental scan
283 indicator measures identified
Literature review (national and international published reports/articles and grey literature)
2. Prioritization
Based on 2 of 6 a priori inclusion criteria ('accurate' and 'amenable to change')
130 indicator measures identified by 2 independent reviewers
3. Ranking (1) by chronic disease surveillance experts based on 2 of 6 a priori inclusion criteria ("accurate" and "amenable to change")
First 70 highest ranking indicators chosen based on a 4-category ranking scale, where 0 meant "not accurate and/or not amenable to change" and 3 meant "highly relevant and/or responsive to change"
4. Ranking (2) by chronic disease surveillance experts: Identification of core indicator and gaps, using full inclusion criteria
First draft of framework (45 indicators): 36 out of 70 indicators identified selection criteria + 9 new indicators identified as gaps from the original set
Framework gaps[a] identified: 9 measures added
5. Consultation – first round: ~ 40 people (from the Agency; Health Canada-ONPP/FNIHB), using full inclusion criteria
Second draft of framework (48 indicators): 45 indicators identified + 3 new indicators suggested as gaps
Framework gaps[a] identified: 3 measures added (retrieved from original list of 130 indicators)
6. Consultation – second round: > 36 people (from the Agency, CIHI, Statistics Canada, CPAC, CMA, APHEO, CPCSSN, among others), using full inclusion criteria
Third draftof framework (39 indicators): 48 + 2 new indicators suggested as gap and 11 indicators removed
Framework gaps[a] identified and indicators removed: 2 measures added and 11 indicators removed
7. Analysis process: focus on pan-Canadian reporting and carried out using national health databases. Work to identify and cover data-gaps is on-going.
Final framework (41 indicators): 39 + 2 new indicators added to cover data gaps
Framework gaps[a] identified: 2 measures added
Social and environmental determinants n = 5 (~2 gaps: social support and built environment)
Early life / childhood risk and protective factors n = 3
Behavioural risk and protective factors n = 9 (~ 1 gap: clustering of risk factors)
Risk conditions n = 5 (~1 gap: metabolic syndrome—data available, analysis pending)
Disease prevention practices n = 7 (~1 gap: high blood pressure screening)
Health outcomes' status n = 12 (prevalence and incidence indicators contain sub-indicators by disease)

Abbreviations: Agency, Public Health Agency of Canada; APHEO, Association of Public Health Epidemiologists in Ontario; CIHI, Canadian Institute for Health Information; CPAC, Canadian Partnership Against Cancer; CMA, Canadian Medical Association; CPCSSN, Canadian Primary Care Sentinel Surveillance Network; FNIHB, First Nations and Inuit Health Branch; ONPP, Office of Nutrition Policy and Promotion.

[a] Framework gaps: key measures identified as missing based on input received during the consultation and statistical analysis processes (step 4 to 7).

chronic diseases, there remains a need to review emerging evidence, confirming additional societal, environmental and community influences in this regard. Of note, some potentially useful indicators (e.g. air quality, social deprivation index, mental health index, sleep problems) were not included in the Framework because they did not meet the one of the selection criteria, namely that data collection be feasible. Finally, selection of protective and resiliency indicators remains weak and is an area for which active engagement is required. The challenge will be to maintain a balance between being comprehensive and flexible on the one hand and ensuring ongoing reporting on a set of core indicators for trend analyses on the other, in order to keep the list of indicators limited and manageable.

Conclusion

The Public Health Agency of Canada undertook the development of the *Indicator Framework for the Surveillance of Chronic Diseases and Associated Determinants in Canada* to provide the foundation for regular reporting on the state of chronic disease in Canada. Despite some limitations, the structured and iterative approach used in its development will ensure the Framework and its related products have the potential to become an indispensable tool for evidence-informed decision making in Canada.

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APPENDIX A
CHRONIC DISEASE INDICATOR FRAMEWORK, QUICK STATS, SPRING 2014 EDITION

INDICATOR GROUP	INDICATOR MEASURE(S)	LATEST DATA[a]	DATA SOURCE (YEAR)
SOCIAL AND ENVIRONMENTAL DETERMINANTS			
Education	% of population with less than a high school education, population aged 20+ years	13.4%	CCHS (2011–2012)
Income	% of population living below low-income cut-offs, after tax, all population	8.8%	SLID (2011)
Employment	Average annual unemployment rate (% of labour force that was unemployed during reference period), population aged 15+ years	7.2%	LFS (2012)
EARLY LIFE/CHILDHOOD RISK AND PROTECTIVE FACTORS			
Birth weight	% of live births with a low birth weight	6.1%	CVS (2011)
Breastfeeding	% of women who report exclusive breastfeeding of their child for at least the first 6 months of life, women aged 15+ years	26.2%	CCHS (2011–2012)
Exposure to second-hand smoke	% of households with children aged less than 12 years regularly exposed to environmental tobacco smoke at home	3.3%	CTUMS (2012)
BEHAVIOURAL RISK AND PROTECTIVE FACTORS			
Smoking	% of population that reports being current smokers (daily and occasional), population aged 15+ years	16.1%	CTUMS (2012)
	Percentage of population that reports current daily smoking, population aged 15+ years	11.9%	CTUMS (2012)
Physical activity	% of children and youth that attain at least 12 000 steps daily (measured), population aged 5 to 17 years	7.0%	CANPLAY (2009–2011)
	% of population that reports being physically "active" or "moderately active" during their leisure time, population aged 20+ years	51.9%	CCHS (2011–2012)
Sedentary behaviour	% of population that reports spending more than 14 hours per week watching television or using computers during leisure time, population aged 12+ years	62.1%	CCHS (2011–2012)
Healthy eating	% of population that report consuming fruit and vegetables at least 5 times per day, population aged 12+ years	40.3%	CCHS (2011–2012)
Unhealthy eating	% of population that reports drinking sugar-sweetened beverages daily, population aged 5 to 19 years	27.2%	CHMS (2009–2011)
Alcohol use	% of population that exceeds low risk alcohol drinking guidelines for chronic drinking, population aged 15+ years	14.4%	CADUMS (2012)
Chronic stress	% of population that reported life to be "quite a bit" or "extremely" stressful most days in the last 12 months, population aged 12+ years	22.6%	CCHS (2011–2012)
RISK CONDITIONS			
Obesity	% of population that is obese (measured), children and youth aged 5 to 17 years	11.7%	CHMS (2009–2011)
	% of population that is obese (measured), population aged 18+ years	26.2%	CHMS (2009–2011)
Elevated blood glucose	% of population that has elevated blood glucose (measured), population aged 20+ years	4.2%	CHMS (2009–2011)
Elevated blood pressure	% of population that has elevated blood pressure (measured), population aged 20+ years	7.8%	CHMS (2009–2011)
Elevated blood cholesterol	% of population that has elevated blood cholesterol (TC:HDL-C ratio [measured]), population aged 20+ years	17.3%	CHMS (2009–2011)
DISEASE PREVENTION PRACTICES (SECONDARY PREVENTION)			
Contact with health care professional	% of population that reported consulting a family physician or general practitioner at least once in the past 12 months, population aged 12+ years	75.2%	CCHS (2012)
	% of population that reported consulting a dentist, dental hygienist or orthodontist at least once in the past 12 months, population aged 12+ years	66.0%	CCHS (2012)
Disease screening	% of women that reported having a mammogram at least once in the past 5 years, population aged 50 to 74 years	83.5%	CCHS (2012)
	% of women that reported having at least 1 Pap smear test in the past 3 years, population aged 25 to 69 years	79.7%	CCHS (2012)
	% of population that reported having at least 1 fecal occult blood test, colonoscopy and/or sigmoidoscopy in the recommended time period, population aged 50 to 74 years	51.1%	CCHS (2012)
Vaccination (influenza)	% of population living with a chronic health condition that reported having a seasonal flu shot in the past 12 months, population aged 12+ years	47.4%	CCHS (2011–2012)

Continued on the following pages

Appendix A (continued)
CHRONIC DISEASE INDICATOR FRAMEWORK, QUICK STATS, SPRING 2014 EDITION

HEALTH OUTCOMES/STATUS			
General health	% of population that rates their health as "very good" or "excellent," population aged 12+ years"	59.9%	CCHS (2011–2012)
	% of population that rates their mental health as "very good" or "excellent," population aged 12+ years	72.2%	CCHS (2011–2012)
	Life expectancy at birth	81.7 years	CCDSS (2006–2008)
	Life expectancy at 65 years	20.5 years	CCDSS (2006–2008)
	Health-adjusted life expectancy at birth	71.8 years	CCDSS (2006–2008)
	Health-adjusted life expectancy at 65 years of age	15.9 years	CCDSS (2006–2008)
Morbidity – Prevalence	% of population with at least 1 major chronic disease (cancer, diabetes, cardiovascular disease, chronic obstructive pulmonary disease), population aged 20+ years	15.7%	CCHS (2011–2012)
	Prevalence of diabetes, children and youth aged 19 years or less	0.3%	CCDSS (2008–2009)[b]
	Prevalence of diabetes, population aged 20+ years	8.7%	CCDSS (2008–2009)[b]
	Prevalence of heart disease, population aged 20+ years	5.5%	CCHS (2011–2012)
	Prevalence of stroke, population aged 20+ years	1.3%	CCHS (2011–2012)
	Prevalence of asthma, children and youth aged 19 years or less	15.2%	CCDSS (2008–2009)[b]
	Prevalence of asthma, population aged 20+ years	8.3%	CCDSS (2008–2009)[b]
	Prevalence of chronic obstructive pulmonary disease, population aged 35+ years	8.7%	CCDSS (2008–2009)[b]
	Prevalence of arthritis, population aged 20+ years	17.6%	CCHS (2011–2012)
	Prevalence of the use of health services for mental disorders, children and youth aged 19 years or less	8.0%	CCDSS (2008–2009)
	Prevalence of the use of health services for mental disorders, population aged 20+ years	16.2%	CCDSS (2008–2009)
	Prevalence of mood disorders and/or anxiety, children and youth aged 19 years or less	7.2%	CCHS (2011–2012)
	Prevalence of mood disorders and/or anxiety, population aged 20+ years	11.2%	CCHS (2011–2012)
	Number of individuals living with or beyond any cancer, that were diagnosed in a 5-year period, all population	518 705 persons	CCR (2004–2008)
	Number of individuals living with or beyond prostate cancer, that were diagnosed in a 5-year period, all population	105 179 persons	CCR (2004–2008)
	Number of individuals living with or beyond lung cancer, that were diagnosed in a 5-year period, all population	29 780 persons	CCR (2004–2008)
	Number of individuals living with or beyond breast cancer, that were diagnosed in a 5-year period, all population	90 677 persons	CCR (2004–2008)
	Number of individuals living with or beyond colorectal cancer, that were diagnosed in a 5-year period, all population	67 173 persons	CCR (2004–2008)
Morbidity – Incidence	Incidence rate of diabetes, children and youth aged 19 years or less	42.7 per 100 000	CCDSS (2008–2009)
	Incidence rate of diabetes in adults aged 20 years and older	813.6 per 100 000	CCDSS (2008–2009)
	Incidence rate of asthma, children and youth aged 19 years or less	1097.8 per 100 000	CCDSS (2008–2009)
	Incidence rate of asthma, population aged 20+ years	392.1 per 100 000	CCDSS (2008–2009)
	Incidence rate of chronic obstructive pulmonary disease, population aged 35+ years	890.4 per 100 000	CCDSS (2008–2009)
	Incidence rate of all cancers, all male population	467.5 per 100 000[d]	CCR (2007)
	Incidence rate of all cancers, all female population	364.8 per 100 000[d]	CCR (2007)
	Incidence rate of prostate cancer, all male population	125.8 per 100 000[d]	CCR (2007)
	Incidence rate of lung cancer, all male population	69.0 per 100 000[d]	CCR (2007)
	Incidence rate of lung cancer, all female population	47.9 per 100 000[d]	CCR (2007)
	Incidence rate of colorectal cancer, all male population	60.8 per 100 000[d]	CCR (2007)
	Incidence rate of colorectal cancer, all female population	40.9 per 100 000[d]	CCR (2007)
	Incidence rate of breast cancer, all female population	98.8 per 100 000[d]	CCR (2007)

Continued on the following page

Appendix A (continued)
CHRONIC DISEASE INDICATOR FRAMEWORK, QUICK STATS, SPRING 2014 EDITION

HEALTH OUTCOMES/STATUS			
Multimorbidity	% of population with multiple chronic diseases[c] (2+ of 10 chronic diseases), population aged 20+ years	14.5%	CCHS (2011–2012)
	% of population with multiple chronic diseases[c] (3+ of 10 chronic diseases), population aged 20+ years	4.9%	CCHS (2011–2012)
Disability	% of population that reports being limited in their activities "sometimes" or "often" due to disease/illness, population aged 12+ years	33.9%	CCHS (2012)
Mortality	Mortality rate due to a major chronic disease (cardiovascular diseases, all cancers, chronic respiratory disease), total population	458.0 per 100 000	CVS (2009)
	Mortality rate due to cardiovascular diseases, total population	203.7 per 100 000	CVS (2009)
	Mortality rate due to cancer, total population	210.9 per 100 000	CVS (2009)
	Mortality rate due to chronic respiratory diseases, total population	43.5 per 100 000	CVS (2009)
	Mortality rate due to suicide, total population	11.5 per 100 000	CVS (2009)
	All-cause mortality rate ratios among people with and without diabetes, population aged 20+ years	2.0 rate ratio[d]	CCDSS (2008–2009)
Premature mortality	Potential years of life lost due to cancer	1504 per 100 000	CVS (2009)
	Potential years of life lost due to cardiovascular diseases	755.4 per 100 000	CVS (2009)
	Potential years of life lost due to chronic respiratory diseases	118.1 per 100 000	CVS (2009)
	Potential years of life lost due to suicide	362.1 per 100 000	CVS (2009)
	Probability of dying (%) between ages 30 and 69 years from major chronic diseases (cardiovascular disease, cancer, chronic respiratory disease, diabetes)	11.4%	CVS (2009)
	Probability of dying (%) between ages 30 and 69 years from cardiovascular disease	3.5%	CVS (2009)
	Probability of dying (%) between ages 30 and 69 years from cancer	7.1%	CVS (2009)
	Probability of dying (%) between ages 30 and 69 years from chronic respiratory diseases	0.7%	CVS (2009)
	Probability of dying (%) between ages 30 and 69 years from diabetes	0.5%	CVS (2009)

Abbreviations: CADUMS, Canadian Alcohol and Other Drug Use Monitoring Survey; CANPLAY, Canadian Physical Activity Levels Among Youth; CCDSS, Canadian Chronic Disease Surveillance System; CCHS, Canadian Community Health Survey; CCR, Canadian Cancer Registry; CHMS, Canadian Health Measures Survey; CTUMS, Canadian Tobacco Use Monitoring Survey; CVS, Canadian Vitals Statistics; LFS, Labour Force Survey; HDL-C, high-density lipoprotein cholesterol; SLID, Survey of Labour and Income Dynamics; TC, total cholesterol.

[a] All rates are crude unless otherwise stated.

[b] CCHS 2011/2012 data exist for this indicator and are available for use when disaggregating by demographic and social markers.

[c] Multimorbidity: Chronic diseases included are heart disease, stroke, cancer, asthma, chronic obstructive pulmonary disease, diabetes, arthritis, Alzheimer's or other dementia, mood disorder (depression), and anxiety.

[d] Rates are age-standardized to the 1991 Canadian population.

Appendix B: Description and Definition of Indicators

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A. Social and Environmental Determinants

1. Education	
Rationale	Education is intricately linked with the health of the population and is an important determinant of health.[1] Education contributes to health and prosperity by: • equipping people with knowledge and skills for problem solving, • helping provide a sense of control and mastery over life circumstances, • increasing opportunities for job and income security and job satisfaction, and • improving people's ability to access and understand information to keep them healthy.
Measure	Percentage of adult population with less than a high (secondary) school education, population aged 20 years and older.
Definition	Percentage of adults who report that their highest level of completed education is less than high (secondary) school expressed as a proportion of the total population.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 20 years and older.
Methods of calculation	Numerator: Number of people aged 20 years and older who report that their highest level of education is less than high (secondary) school completion. Denominator: Total population aged 20 years and older.
Additional notes	A low rate for this indicator can be interpreted as a positive result.
2. Income	
Rationale	Level of income is recognized as an important determinant of health.[1,2] Level of income influences living conditions such as the ability to afford safe housing and buy sufficient, nutritious food. Low income influences health-related behaviour such as quality of diet, level of physical activity and other risk factors. In the long run, low levels of income affect individuals' health by lessening their abilities to make healthier choices and lead fulfilling day-to-day lives. Low income denies people access to decent housing, education, transport and other factors vital to full participation in life. The stresses of living in poverty can be particularly harmful.[2] Low income is linked to increased prevalence of risk factors for chronic diseases and higher prevalence of chronic conditions. There is compelling evidence linking poverty to both reduced health and chronic diseases.
Measure	Percentage of population living below low-income cut-offs, after tax, all population.
Definition	Proportion of the population who live below Low Income Cut-Offs (LICOs), spending a disproportionately higher proportion of their after-tax household income on basic food, shelter and clothing than the average Canadian family.
Data source	Survey of Labour and Income Dynamics, Statistics Canada.
Population	Total population.
Methods of calculation	Numerator: Number of people living in households where the after-tax income of that household falls below identified LICOs. Denominator: Total population.
Additional notes	The use of LICOs is an established and widely recognized approach to estimating the population living in poverty or near-poverty conditions in Canada.[3] The LICO approach estimates the number of families (and subsequently, individuals) who spend a disproportionately higher proportion of their after-tax household incomes on basic food, shelter and clothing than the average Canadian family. A low rate for this indicator can be interpreted as a positive result.
3. Employment (Average Annual Unemployment Rate)	
Rationale	Unemployment, underemployment and stressful or unsafe work are associated with poorer health.[2] Employment has a significant effect on a person's physical, mental and social health. Paid work provides not only financial resources but also a sense of identity and purpose, social contacts and opportunities for personal growth.[1] When people lose these benefits, the results can have negative impacts on their health and on that of their family. Unemployment often leads to material deprivation and poverty by reducing income and other employment benefits. Losing a job is a stressful event that can impact self-esteem and increase levels of worry and anxiety, which in turn may increase the likelihood of a person turning to unhealthy coping behaviours such as tobacco use or high alcohol use. In general, unemployed people have a reduced life expectancy and suffer more health problems than people who are employed.
Measure	Average annual unemployment rate (percentage of labour force who was unemployed during reference period), population aged 15 years and older.
Definition	Percentage of the labour force aged 15 years and older who did not have a job (but looked for a job) at any time in the previous year.
Data source	Labour Force Survey, Statistics Canada.
Population	Population aged 15 years and older.
Methods of calculation	Numerator: Number of people in the labour force who did not have a job (but looked for a job) at any time in the previous year. Denominator: Labour force (see notes below).
Additional notes	The "labour force" is the population aged 15 years and older who are either employed or unemployed. The labour force does not include those who were not working nor anticipating return to work and were not available nor looking for work. A low rate for this indicator can be interpreted as a positive result.

B. Early Life / Childhood Risk and Protective Factors

4. Birth Weight (Low Birth-Weight)	
Rationale	Birth weight is an indicator of the general health of newborns and a key determinant of infant survival, health and development. Babies born with low birth-weight are at higher risk of death in infancy, severe childhood disease and long-term sequelae (e.g. disability). Low birth-weight is associated with poorer growth in childhood and increased risk of developing type 2 diabetes and cardiovascular diseases later in life.[4,5,6]
Measure	Percentage of live births with a low birth-weight, all live births.
Definition	Percentage of live births weighing less than 2500 g (low birth weight) expressed as a proportion of all live births.
Data source	Canadian Vital Statistics - Birth Database, Statistics Canada. Birth Database, l'Institut de la statistique du Québec (supplementary file).
Population	All live births.
Methods of calculation	Numerator: Number of live births with birth weight less than 2500 g. Denominator: Number of live births, with known birth weight.
Additional notes	Low birth-weight is defined by the World Health Organization as weight at birth of less than 2500 g. Low birth-weight can be attributed to pre-term birth, growth restriction in uterus or both.[7] A low rate for this indicator can be interpreted as a positive result.
5. Breastfeeding	
Rationale	Breastfeeding is recognized as the optimal method of infant feeding due to its beneficial effects on infant growth, immunity and cognitive development.[8] Breastfeeding initiation and, more importantly, the continuation of exclusive breastfeeding for the first 6 months of a child's life are recommended by Canadian and other international public health and health care organizations.[9,10], The beneficial short-term health outcomes of breastfeeding for the infant are well recognized. Evidence suggests that children who are breastfed have lower blood pressure, lower cholesterol levels and were less likely to develop diabetes and cardiovascular diseases.[11,12] Recent evidence also suggests that breastfeeding is associated with improved longer-term health outcomes[13] and that breastfeeding for 6 or more months protects against overweight and obesity later in life.[14]
Measure	Percentage of women who report exclusive breastfeeding of their child for at least the first 6 months of life, women aged 15 to 55 years and older.
Definition	Proportion of women who gave birth in the previous 5 years and report exclusively breastfeeding their last child for 6 months or more.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Women aged 15 years and older who gave birth in the last 5 years.
Methods of calculation	Numerator: Number of women who gave birth in the last 5 years and report breastfeeding exclusively for 6 months or more. Denominator: Number of women who gave birth in the last 5 years.
Additional notes	Exclusive breastfeeding is defined as "an infant's consumption of human milk with no supplementation of any type (no water, no juice, no nonhuman milk, and no foods) except for vitamins, minerals and medications." This measure excludes women aged over 55 years and those who were still breastfeeding at the time of the survey and had not yet added any other liquid or solid foods to the baby's feeds. A high rate for this indicator can be interpreted as a positive result.
6. Exposure to Second-Hand Smoke	
Rationale	Chronic exposure to second-hand smoke is strongly associated with increased risk of respiratory conditions such as asthma and respiratory infections. Chronic exposure to second-hand smoke at a young age has also been linked to heart diseases and neurological disorders (sudden infant death, sleep difficulties) and certain cancers in adults (lung and breast cancer).[15,16] Passive smoking poses a greater risk to children than to adults in the same setting due to children's higher breathing rates per body weight and higher lung surface area relative to that of adults.[17] In addition, younger children do not always have a choice of environment and cannot remove themselves from exposure in the way an adult could. Growing up in a smoke-free home is essential for children's optimal growth and development.
Measure	Percentage of households with children aged less than 12 years regularly exposed to environmental tobacco smoke at home.
Definition	Percentage of households with children aged less than 12 years living in the household with at least one person (including family members or visitors) smoking inside their home regularly (every day or almost every day).
Data source	Canadian Tobacco Use Monitoring Survey, Health Canada.
Population	Canadian households with children aged less than 12 years living in the household.
Methods of calculation	Numerator: Number of households reporting having children aged less than 12 years living in the household and with at least one person smoking inside their home regularly. Denominator: Number of households reporting having children aged less than 12 years living in the household.
Additional notes	A low rate can be interpreted as a positive result.

C. Behavioural Risk and Protective Factors

7. Smoking	
Rationale	There is strong evidence that smoking tobacco is related to more than 24 chronic diseases and conditions such as respiratory disease, cardiovascular disease and cancer. Smoking tobacco: •has negative effects on nearly every organ of the body •reduces overall health •is the leading cause of preventable death •has negative health impacts on people of all ages: unborn babies, infants, children, adolescents, adults and seniors.[18] Lung cancer is the leading cause of death due to cancer in Canada. Smoking tobacco is the single most important preventable cause of lung cancer, accounting for 85% of all new cases of lung cancer in Canada.[18]
Measure(s)	a. Percentage of population who report being current smokers (daily and occasional), population aged 15 years and older. b. Percentage of population who report being current daily smokers, population aged 15 years and older.
Definition	Percentage of people aged 15 years and older who report that at the present time they smoke cigarettes "daily and occasionally" or just "daily."
Data source	Canadian Tobacco Use Monitoring Survey, Health Canada.
Population	Population aged 15 years and older.
Methods of calculation	a. Daily and Occasional: Numerator: Number of people, aged 15 years and older, who are current (daily or occasional) cigarette smokers. Denominator: Total population, aged 15 years and older. b. Daily: Numerator: Number of people, aged 15 years and older who are current (daily) cigarette smokers. Denominator: Total population, aged 15 years and older.
Additional notes	A low rate for this indicator can be interpreted as a positive result.
8. Physical Activity (Step Counts), Children and Youth	
Rationale	Strong evidence supports a dose-response between physical activity and health: the most physically active people have the lowest risk of poor health.[19] Increments of physical activity have been significantly associated with reduced all-cause mortality risk and found to be an important factor for the prevention and control of chronic diseases such as cardiovascular diseases,[20] stroke,[21] cancer,[22] and type 2 diabetes.[23] In addition, recent research suggests that physical activity is associated with improved symptoms of depression, anxiety and low self-esteem in children and adolescents as well as improvements in cognitive performance and academic achievement.[24,25]
Measure	Percentage of children and youth who attain at least 12 000 steps daily (measured), population age 5 to 17 years.
Definition	Percentage of children and youth aged 5 to 17 years who take at least 12 000 steps per day every day of the week.
Data source	Canadian Physical Activity Levels Among Youth (CANPLAY), Canadian Fitness and Lifestyle Research Institute.
Population	Children and youth aged 5 to 17 years.
Methods of calculation	This indicator represents the percentage of children and youth who take at least 12 000 steps per day every day of the week. Step counts are measured over a 7-day period of pedometer wear.[26,27]
Additional notes	The Canadian Physical Activity Guidelines recommend that, for health benefits, children and youth aged 5 to 17 years have at least 60 minutes of moderate- to vigorous-intensity physical activity per day.[28] Pedometers broadly measure many forms of physical activity across all domains including leisure, travel to school, many sports and chores and work situations. Taking 12 000 steps per day can be used as a proxy for measuring adherence to the Canadian guidelines.[29] Step count is recognized as a conservative estimate since some forms of physical activity, such as swimming and bicycle riding, are not well measured by pedometers. A high number of daily steps can be interpreted as a positive result.
9. Physical Activity (Leisure Time Physical Activity), Adults	
Rationale	Strong evidence supports a dose-response between physical activity and health: the most physically active people have the lowest risk of poor health.[19] Increments on physical activity have been significantly associated with reduced all-cause mortality risk and found to be an important factor in the prevention and control of chronic diseases such as cardiovascular diseases,[26] stroke,[27] cancer[28] and type 2 diabetes.[29–31]
Measure	Percentage of population who are physically "active" or "moderately active" during their leisure time, population aged 20 years and older.
Definition	Percentage of people aged 20 years and older who are classified as "active" or "moderately active" according to the Leisure Time Physical Activity (LTPA) Index.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 20 years and older.
Methods of calculation	Numerator: Number of people aged 20 years and older who are physically "active" or "moderately active" during leisure time. Denominator: total population aged 20 years and older.
Additional notes	LTPA Index is a composite measure that categorizes individuals as "active," "moderately active" or "inactive" based on responses to questions on total daily energy expended during leisure time activities in the previous 3 months. It is a proxy measure of total physical activity. A high rate for this indicator can be interpreted as a positive result.

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10. Sedentary Behaviour (Screen Time)	
Rationale	Evidence suggests that sedentary behaviour has direct physiological effects on metabolism and vascular health.[30,31] A dose-response relationship between the time spent in sedentary behaviours and increase in all-cause and cardiovascular disease mortality has also been found.[32] Television viewing and computer use are the most widely studied sedentary behaviours and data on these activities are readily available in a number of surveys. Recent studies have found that screen time (time spent viewing television, using computers or playing video games) is positively associated with inactive leisure time, a poor diet and obesity.[33] Excessive screen time increases the risk of obesity and weight gain regardless of physical activity levels and increases the risk of cardiovascular events and mortality.[34,35]
Measure	Percentage of population who report spending more than 14 hours per week watching television and/or using computers during leisure time, population aged 12 years and older.
Definition	Proportion of people aged 12 years and older who report spending more than 14 hours per week watching television and/or using computers during leisure time.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people aged 12 years and older who report spending more than 14 hours per week watching television, videos and/or using computers during leisure time. Using computers includes playing computer games and using the Internet. Denominator: Total population aged 12 years and older.
Additional notes	Sedentary activities such as reading or sleeping are not included in this measure. Canadians Sedentary Behaviour Guidelines have been established for children and youth aged 0 to 17 years. These guidelines recommend that recreational screen time be restricted to no more than 2 hours per day for children and youth aged 5 to 17 years.[36] This indicator can provide a conservative estimate of the number of children who exceed these guidelines. A sedentary time target for adults has not been clearly defined, but 2 hours per day has been identified in the literature as an appropriate threshold for increased chronic disease risk.[37] A low rate for this indicator can be interpreted as a positive result.
11. Healthy Eating	
Rationale	A healthy diet can help prevent or control chronic conditions and diseases such as high blood pressure, obesity,[38,39] cardiovascular diseases,[40] diabetes[41] and osteoporosis.[42,43] Healthy eating has also been associated with reduced all-cause mortality.[44] Daily consumption of vegetables and fruits has been validated as an indicator of diet quality.[45]
Measure	Percentage of population who report consuming fruits and vegetables at least 5 times per day, population aged 12 years and older.
Definition	Percentage of people who report usually eating vegetables and fruits at least 5 times per day.
Data source	Canadian Community Health Survey (CCHS), Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people aged 12 years and older who report consuming fruits and vegetables 5 or more times per day. Denominator: Total population, aged 12 years and older.
Additional notes	Validation studies indicate that a Food Frequency Questionnaire (FFQ) such as that included in the CCHS can be used reliably as a proxy for quantified intake of fruit and vegetables (i.e. number of servings per day) and an approximation of diet quality.[46] This indicator is NOT included as a measure of compliance with Canada's Food Guide.[47] A high rate for this indicator can be interpreted as a positive result.
12. Unhealthy Eating (Sugar-Sweetened Beverage Consumption)	
Rationale	Consumption of sugar-sweetened beverages (SSBs) has increased considerably worldwide in recent decades. The consumption of SSBs, particularly soda and fruit drinks, which provide little nutritional value and have little impact on satiety, has been associated with excess energy intake. Large cohort and experimental studies show a strong positive association between greater intakes of SSBs and weight gain and obesity in both children and adults.[48]
Measure	Percentage of population who report drinking SSBs daily, population aged 5 to 19 years.
Definition	Percentage of children and youth who report consuming SSBs every day.
Data source	Canadian Health Measures Survey, Statistics Canada.
Population	Population aged 5 to 19 years.
Methods of calculation	Numerator: Number of people aged 5 to 19 years who report consuming SSBs at least once a day every day. Denominator: Total population, aged 5 to 19 years.
Additional notes	Children were classified as drinking SSBs (i.e. regular soft drinks, sport drinks or fruit drinks) every day if their average daily consumption was equal or greater than 1 SSB per day. Canada's Food Guide[47] recommends limiting beverages high in calories, such as fruit-flavoured drinks, soft drinks, sports and energy drinks and sweetened hot or cold drinks. A low rate for this indicator can be interpreted as a positive result.

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13. Alcohol Use	
Rationale	According to the World Health Organization, unsafe alcohol use is the third most harmful risk factor for chronic diseases in developed countries.[49] Long-term excess alcohol consumption is associated with increased risk of chronic diseases such as chronic liver disease, certain cancers, cardiovascular diseases (hypertensive heart disease, ischemic heart disease, stroke) and premature death.[50] National Low-Risk Alcohol Drinking Guidelines were developed to help Canadians moderate their alcohol consumption and reduce immediate and long-term alcohol-related harm.[51]
Measure	Percentage of population who exceed low-risk alcohol drinking guidelines for chronic drinking, population aged 15 years and older.
Definition	Percentage of people aged 15 years and older who report drinking alcohol over the Canadian guidelines on low-risk drinking aimed at reducing long-term health risks.
Data source	Canadian Alcohol and Drug Use Monitoring Survey (CADUMS), Health Canada.
Population	Population aged 15 years and older.
Methods of calculation	Numerator: Number of people aged 15 years and older who report drinking alcohol over the Canadian guidelines on low-risk drinking. Denominator: Total Population, aged 15 years and older.
Additional notes	The latest Canadian guidelines for low-risk drinking for long-term health risks recommend no more than 10 standard drinks* per week for women and no more than 15 standard drinks per week for men.[49] *A standard drink is equivalent to 13.6 g of alcohol. A low rate for this indicator can be interpreted as a positive result.
14. Chronic Stress	
Rationale	Exposure to chronic stress, a state of prolonged tension from internal or external stressors, triggers predictable biochemical and physiological changes in the body that are detrimental to the nervous and immune system.[52] Epidemiological evidence shows that chronic stress is associated with the development of many common chronic diseases.[53,54] Chronic stress has been shown to increase heart rate and blood pressure that eventually lead to serious consequences such as cardiovascular diseases (myocardial infarction, heart failure, stroke)[55,56] and mental illness. In addition, increased exposure to stress can contribute to poorer coping skills and poorer health behaviours such as smoking, excess alcohol consumption and unhealthy eating habits that are detrimental to health and contribute to chronic diseases.
Measure	Percentage of population who report life to be "quite a bit" or "extremely" stressful most days in the previous 12 months, population aged 12 years and older.
Definition	Percentage of people aged 12 years and older who report that in the last year most days were "quite a bit stressful" or "extremely stressful" (versus "not at all stressful," "not very stressful" or "a bit stressful").
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people, aged 12 years and older who report life to be "quite a bit" or "extremely" stressful most days in the last 12 months. Denominator: Total population, aged 12 years and older.
Additional notes	Self-perceived life stress is used as a proxy for chronic stress and measures the perception that life feels quite a bit or extremely stressful most days in the last year. A low rate for this indicator can be interpreted as a positive result.

D. Risk Conditions

15. Obesity	
Rationale	Obesity is defined as excessive accumulation of body fat that presents a risk for health.[57] Obesity is a risk factor for a number of chronic conditions such as cardiovascular diseases, certain types of cancer, type 2 diabetes, osteoarthritis, mental health conditions and other negative health outcomes.[58-60] Among children, excess body fat has also been found to correlate with negative health outcomes, both in the short and longer term.[61,62] Obesity is one of the main health challenges in Canada. The World Health Organization (WHO) considers obesity to be the fifth leading risk factor for global deaths. The fundamental cause of obesity and overweight is an imbalance between energy consumed and energy expended.
Measure(s)	a. Percentage of the population who are obese (measured), children and youth aged 5 to 17 years. b. Percentage of the population who are obese (measured), population aged 18 years and older.
Definition	Percentage of population classified as being obese. For adults, obesity is defined as Body Mass Index (BMI) measured as 30.0 kg/m^2 or higher. For children and youth, obesity is defined according to the 2007 WHO BMI age/sex specific cut-offs.[63]
Data source	Canadian Health Measures Survey, Statistics Canada.
Population	Children and youth: Population aged 5 to 17 years. Adults: Population aged 18 years and older.
Methods of calculation	Numerator: Number of people who are classified as obese according to BMI. Denominator: Total population.
Additional notes	BMI for these measures is calculated from measured weight and height. BMI is an index of weight-for-height that correlates with amount of body fat and therefore is used to identify overweight and obesity in adults. For adults a fixed BMI cut-off of 30 kg/m^2 is used to define obesity. Given the variability in BMI among children as they grow, no such fixed values exist and BMI cut-offs are age- and sex-specific and derived from a specific reference population. A low rate for this indicator can be interpreted as a positive result.
16. Elevated Blood Glucose	
Rationale	Persistent high blood glucose can lead to microvascular damage (e.g. diabetic nephropathy, neuropathy and retinopathy) and macrovascular complications (e.g. coronary artery disease, peripheral vascular disease and stroke).[64] Diabetes is a chronic condition characterized by the body's inability to produce or use insulin resulting in high blood glucose. Even at levels below the threshold for the diagnosis of diabetes, a persistently high blood glucose level can lead to the development of conditions such as coronary heart disease and stroke.[65,66] Early detection of high blood glucose in undiagnosed patients and tight glycemic control in patients who have a clinical diagnosis of diabetes decreases the progression of microvascular complications[67] and may reduce the burden of diabetes and its complications.[68,69,70]
Measure	Percentage of population who have elevated blood glucose (measured), population aged 20 years and older.
Definition	Percentage of people aged 20 to 79 years with an elevated blood glucose level, defined as a fasting serum glucose level 7.0 mmol/L or higher.
Data source	Canadian Health Measures Survey, Statistics Canada.
Population	Population aged 20 to 79 years.
Methods of calculation	Numerator: Number of people aged 20 to 79 years with an elevated fasting serum glucose level. Denominator: Total population aged 20 to 79 years who had a fasting serum glucose test done.
Additional notes	A fasting serum glucose level 7.0 mmol/L or higher[71] is used to clinically diagnose high blood glucose in a single fasted blood sample drawn during a clinical visit, regardless of diabetes status. This indicator captures people with elevated blood glucose, regardless of previous diagnosis of diabetes. This indicator will not capture individuals with diabetes who have well controlled blood glucose levels and cannot be used as an indicator of diabetes prevalence. Note the additional breakdown by diagnosis status that provides rates of high blood glucose by diabetes diagnosis (i.e. diagnosis determined based on self-report diabetes previously identified by a health professional). A low rate for this indicator can be interpreted as a positive result.
17. Elevated Blood Pressure	
Rationale	High blood pressure (HBP) can lead to vascular damage and is a significant risk factor for premature cardiovascular diseases (stroke, coronary artery disease, heart failure and peripheral vascular disease).[72] Multiple studies indicate that the mortality rate for cardiovascular diseases increases progressively with a rise in blood pressure levels starting at levels as low as 115/75 mm Hg.[73] The prevention and control of HBP, through lifestyle changes and/or medication, can result in a significant risk reduction of stroke and coronary heart disease.[74,75]
Measure	Percentage of population who have elevated blood pressure (measured), population aged 20 years and older.
Definition	Percentage of people aged 20 to 79 years who have HBP, defined as a measured systolic blood pressure of 140 mm Hg or higher or a diastolic pressure of 90 mm Hg or higher.
Data source	Canadian Health Measures Survey, Statistics Canada.
Population	Population aged 20 to 79 years.

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17. Elevated Blood Pressure (Continued)	
Methods of calculation	Numerator: Number of people aged 20 to 79 years with HBP. Denominator: Total population aged 20 to 79 years.
Additional notes	The definition of HBP (i.e. systolic pressure 140 mm Hg or higher and diastolic pressure 90 mm Hg or higher) is based on the Canadian Hypertension Education Program 2012 recommendations[76] that correspond with the seventh report of the Joint National Committee guidelines for classification and management of blood pressure for adults.[77] This indicator captures people with HBP when assessed at a single clinical visit, regardless of hypertension diagnosis. As such, this indicator will not capture individuals with diagnosed hypertension who have well controlled blood pressure, and it cannot be used as an indicator of hypertension prevalence. Note the additional breakdown by diagnosis status that provides rates of HBP by diagnosis (i.e. diagnosis determined based on self-report hypertension previously diagnosed by a health professional and/or use of medication for HBP). A low rate for this indicator can be interpreted as a positive result.
18. Elevated Blood Cholesterol	
Rationale	The ratio of total cholesterol (TC) to high-density lipoprotein (HDL) is an established predictor of coronary heart disease and a good indicator of abnormal cholesterol metabolism.[78] The TC to HDL ratio is a simple, non-invasive and cost effective means of predicting the presence and extent of coronary atherosclerosis and a marker of cardiovascular risk (coronary artery disease, ischemic stroke)[79,80] and insulin resistance.[81] The risk for cardiac events is significantly higher when the TC:HDL ratio is 5 mmol/L or greater.[82,83]
Measure	Percentage of population who have elevated blood cholesterol (TC:HDL) ratio (measured), population aged 20 to 79 years and older.
Definition	Percentage of people aged 20 to 79 years who, in a nationally representative cross-sectional sample, were found to have elevated blood cholesterol measured as a TC:HDL ratio of 5 mmol/L or higher.
Data source	Canadian Health Measures Survey, Statistics Canada.
Population	Population aged 20 to 79 years.
Methods of calculation	Numerator: Number of people aged 20 to 79 years with an elevated fasting TC:HDL ratio. Denominator: Number of people aged 20 to 79 years who have had a fasting TC:HDL ratio test done.
Additional notes	The 5.0 mmol/L or higher TC:HDL ratio cut-off is based on recommendations from the Canadian Guidelines for the Diagnosis and Treatment of Dyslipidemia and Prevention of Cardiovascular Disease in Adults.[82,84] This indicator captures people found to have elevated TC:HDL ratio in a single fasted blood sample, regardless of previous diagnosis of elevated blood cholesterol. As such, this indicator will not capture individuals with diagnosed high blood cholesterol who have well controlled cholesterol and therefore cannot be used as an indicator of diagnosed high blood cholesterol. Note the additional breakdown by diagnosis status that provides rates of high blood cholesterol (elevated TC:HDL) by diagnosis (i.e. diagnosis determined based on self-report high blood cholesterol previously identified by a health professional). A low rate for this indicator can be interpreted as a positive result.

E. Disease Prevention Practices (Secondary Prevention)

19. Contact with Health Care Professionals (Primary Health Care Provider)	
Rationale	Establishing an ongoing relationship with a primary health care provider is important in maintaining health and ensuring optimal health care including preventative screening, early treatment and better management of chronic diseases.[85] Access to primary care also opens opportunities for health promotion such as advice on healthy living and mental health counselling.[86] Regular access to a family physician can improve health outcomes and reduce health care costs by reducing the use of specialist and hospital services.
Measure	Percentage of population who report consulting a family physician or general practitioner at least once in the previous 12 months, population aged 12 years and older.
Definition	Percentage of people who report consulting a primary health care provider (i.e. a family physician or general practitioner) at least once in the previous 12 months for care or advice about their physical, emotional or mental health.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people aged 12 years and older who report consulting a primary care provider at least once in the previous 12 months. Denominator: Total population aged 12 years and older.
Additional notes	A high rate for this indicator can be interpreted as a positive result.
20. Contact with Health Care Professionals (Dental Health Professional)	
Rationale	Oral health is an integral part of overall good health. Regular dental visits are critical for the early diagnosis and prevention of oral disorders such as tooth decay and periodontal disease. The Canadian Dental Association found that Canadians who do not have access to regular dental care experience poorer oral health and poorer overall health.[87]
Measure	Percentage of population who report consulting a dentist, dental hygienist or orthodontist at least once in the previous 12 months, population aged 12 years and older.
Definition	Percentage of people who report consulting a dental care professional (i.e. a dentist, dental hygienist or orthodontist) at least once in the previous 12 months.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people aged 12 years and older who report consulting a dental care professional at least once in the previous 12 months. Denominator: Total population, aged 12 years and older.
Additional notes	A high rate for this indicator can be interpreted as a positive result.
21. Disease Screening (Breast Cancer Screening)	
Rationale	Breast cancer is the most common form of cancer among Canadian women and the second leading cause of cancer death.[88] Screening mammography for breast cancer is widely viewed as a beneficial health intervention for women aged 50 to 74 years. There is strong evidence from large experimental and population studies that mammography screening reduces mortality due to breast cancer by 25% to 30%.[89,90]
Measure	Percentage of women who report having a mammogram at least once in the previous 5 years, population 50 to 74 years.
Definition	Percentage of target population (i.e. women aged 50 to 74 years) who report having had a screening mammography in the previous 5 years.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Target population for screening: women aged 50 to 74 years.
Methods of calculation	Numerator: Number of women aged 50 to 74 years who had a screening mammogram at least once in the previous 5 years. Denominator: Total number of women aged 50 to 74 years.
Additional notes	The 5-year interval in this indicator is NOT consistent with current national guidelines of "routinely screening with mammography every 2 to 3 years" for average risk women aged 25 to 69 years.[91,92] Current data can only provide estimates of the population that reports a mammogram in the previous 5 years. A high rate for this indicator can be interpreted as a positive result.
22. Disease Screening (Cervical Cancer Screening)	
Rationale	Having a regular Papanicolaou (Pap) smear test is associated with reduced cervical cancer incidence and mortality.[93] Pap smear tests can identify pre-cancerous lesions before they become cancerous or when the disease is at an early stage and treatment is most effective. While invasive cervical cancer is largely preventable, it remains the 13th most common cancer among Canadian women of all ages. Inadequate or lack of screening has been identified as the primary attributable factors.[94]
Measure	Percentage of women who report having at least 1 Pap smear test in the previous 3 years, population aged 25 to 69 years.
Definition	Percentage of women aged 25 to 69 years who had at least 1 Pap smear test in the previous 3 years, as recommended by the latest Canadian guidelines.

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22. Disease Screening (Cervical Cancer Screening) [Continued]	
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Women aged 25 to 69 years.
Methods of calculation	Numerator: Number of women aged 25 to 69 years who had at least 1 Pap smear test in the previous 3 years. Denominator: Total number of women aged 25 to 69 years (excludes women who had a hysterectomy).
Additional notes	Canadian guideline recommendations for cervical cancer screening are for asymptomatic women who are or have been sexually active.[95] The latest Canadian guidelines for cervical cancer screening recommend routine screening every 3 years for women aged 25 to 69 years. This indicator can be used as an approximation of cervical cancer screening utilization rate and includes women who are not or have never been sexually active. A high rate for this indicator can be interpreted as a positive result.
23. Disease Screening (Colorectal Cancer Screening Participation Rate)	
Rationale	Colorectal cancer is the second most common cancer among Canada men, the third most common cancer in Canadian women and the second leading cause of cancer death in Canada.[96] Screening can potentially reduce colorectal cancer incidence (through detection in precancerous stage) and mortality (through detection in earlier stage).[97]
Measure	Percentage of population who report having at least 1 fecal occult blood test (FOBT), colonoscopy and/or sigmoidoscopy in the recommended time period, population aged 50 to 74 years.
Definition	Percentage of people aged 50 to 74 years who report having had at least 1 FOBT in the previous 2 years and/or 1 colonoscopy or sigmoidoscopy in the previous 5 years.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 50 to 74 years.
Methods of calculation	Numerator: Number of people aged 50 to 74 years who had a colorectal cancer screening test at least once in the recommended time period (less than 2 years for FOBT and less than 5 years for colonoscopy or sigmoidoscopy). Denominator: Total population aged 50 to 74 years.
Additional notes	This indicator can be used as an approximation of colorectal cancer screening utilization rate. The latest Canadian guidelines for colorectal cancer screening indicate that there is good evidence to support the inclusion of an annual or biennial FOBT and fair evidence to include sigmoidoscopy in the periodic health examination of asymptomatic individuals aged 50 years and older. For individuals at normal risk, colonoscopy is not commonly used as an initial colorectal cancer screening test. A high rate for this indicator can be interpreted as a positive result.
24. Vaccination (Influenza)	
Rationale	Rates of complications, hospital admissions and death from communicable diseases such as influenza are higher among adults with major chronic diseases.[98] Annual influenza immunization can • prevent the onset of influenza, • help control an acute episode of influenza if it occurs, and • generally help with the control and management of chronic disease complications.[99] To reduce morbidity and mortality associated with influenza, the Canadian National Advisory Committee on Immunizations (NACI) recommends that immunization programs focus on those at high risk of influenza-related complications, among other priority groups. According to NACI's 2011/12 recommendations, chronic diseases associated with higher risk of influenza-related complications include cardiac or pulmonary disorders, diabetes and other metabolic diseases, cancer and immune-compromising conditions (due to underlying disease and/or therapy, etc.).[100]
Measure	Percentage of population aged 12 years and older and living with a chronic health condition* who report having a seasonal flu shot in the previous 12 months.
Definition	Percentage of people aged 12 years and older and living with a chronic disease who report having had an influenza immunization (flu shot) in the previous 12 months.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older living with a chronic disease.
Methods of calculation	Numerator: Number of people aged 12 years and older living with a chronic disease* who report having had a flu shot in the previous 12 months. Denominator: Total population aged 12 years and older living with a chronic disease.*
Additional notes	*The chronic diseases included are cardiovascular diseases (heart disease, stroke), chronic respiratory diseases (asthma, chronic obstructive pulmonary disease [COPD]), diabetes and cancer (all types). A high rate for this indicator can be interpreted as a positive result.

F. Health Outcomes/Status

25. General Health (Self-Rated Health)	
Rationale	Self-rated health measures an individual's perception of his or her overall health. Research shows that a person's appraisal of their general health is a powerful predictor of morbidity and mortality, even after controlling for a variety of sociodemographic, psychosocial and physical health status indicators.[101] Poor self-perceived health is associated with the presence of chronic diseases, level of disability, pain and health risk behaviours, such as lower levels of physical activity and smoking, among others.[102,103]
Measure	Percentage of population who rate their health as "very good" or "excellent," population aged 12 years and older.
Definition	Percentage of people aged 12 years and older who rate their health as "excellent" or "very good," expressed as a proportion of the total population aged 12 years and older.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people aged 12 years and older who rate their health as "very good" or "excellent." Denominator: Total population aged 12 years and older.
Additional notes	Self-rated health is a proxy measure of overall health status. A high rate on this indicator can be interpreted as a positive result.

26. General Health (Self-Rated Mental Health)	
Rationale	Both physical and mental health can influence overall health. Good mental health is not only characterized by the absence of mental illness (such as mental disorders, emotional problems or distress) but also by the presence of factors such as ability to enjoy life, balance and flexibility.[104], Bi-directional associations between mental health problems and chronic diseases exist. Mental health problems, especially depression and anxiety, frequently precede chronic disease development. People with long-term chronic diseases have an increased risk of developing mental health problems and report high levels of distress.[105,106]
Measure	Percentage of population who rate their mental health as "very good" or "excellent," population aged 12 years and older.
Definition	Percentage of people who rate their mental health as "excellent" or "very good," expressed as a proportion of the total population aged 12 years and older.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people, aged 12 years and older who rate their health as being "very good" or "excellent." Denominator: Total population, aged 12 years and older.
Additional notes	Research suggests that self-rated mental health shows a strong and consistent association with psychological distress, depressive symptoms, activity limitation and physical and emotional role functioning.[107] Self-rated mental health is therefore considered to be a proxy for the general mental health and an overall indicator of health status. A high rate on this indicator can be interpreted as a positive result.

27. General Health (Life Expectancy)	
Rationale	Life expectancy is widely used in Canada and worldwide as a measure of overall population health status.[108] Life expectancy measures the predicted number of years of life remaining.[109] There are 2 commonly used measures: "life expectancy at birth" describes the health of a population as a whole and "life expectancy at age 65 years" reflects the health status among the elderly.
Measure(s)	a. Life expectancy at birth. b. Life expectancy at age 65 years.
Definition	Life expectancy at birth measures the average number of years a person would be expected to live, based on a set of age-specific death rates in a given observation period. Life expectancy at age 65 years measures the average number of years remaining to be lived by those surviving to the age of 65 years, based on a set of age-specific death rates in a given period.
Data source	Canadian Chronic Disease Surveillance System, Public Health Agency of Canada.
Population	Total population.
Methods of calculation	Life expectancy at birth and at age 65 years are calculated using period life tables that provide a cross-sectional view on mortality and survival experience of a population for a specified time period (3-year period). Life expectancy tables are calculated based on death probabilities. The method used to calculate this indicator is the Chiang's method.[110] The period life table uses 19 standard age groups (<1, 1–4, 5–9,..., 80–84, 85+ years). The Gompertz function is used to provide an accurate estimate of life expectancy for the last open-ended 85+ age interval.[111] Mortality estimates are based on 3 years of mortality data.
Additional notes	Life expectancy at birth is the average number of years a newborn can expect to live if he or she experienced the age-specific mortality rates prevalent in a particular year. Life expectancy at age 65 years is the average number of years remaining to be lived by those surviving to the age of 65 years. A high number (years) for this indicator can be interpreted as a positive result.

28. General Health (Health-Adjusted Life Expectancy)	
Rationale	Health-Adjusted Life Expectancy (HALE) refers to the number of years an individual is expected to live in full health, from a specific age. HALE combines morbidity and mortality data in one single indicator of population health and is therefore not only a measure of quantity of life but also a measure of quality of life.[112] HALE at birth is often compared to life expectancy at birth to assess how many years of life are spent without good health or quality of life.[112]

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28. General Health (Health-Adjusted Life Expectancy) [Continued]	
Measure(s)	a. Health-adjusted life expectancy at birth. b. Health-adjusted life expectancy at age 65 years.
Definition	HALE represents the number of expected years of life equivalent to years lived in full health, based on the average experience in a population.[113]
Data source	Canadian Chronic Disease Surveillance System, Public Health Agency of Canada. Canadian Community Health Survey (CCHS), Statistics Canada.
Population	Total population.
Methods of calculation	HALE combines measures of both age- and sex-specific health status, and age- and sex-specific mortality (3-year period) into a single statistic. The adapted Sullivan method,[114] an extension of the Life Table method, is used to derive this measure. The period life table uses 19 standard age groups (<1, 1–4, 5–9,..., 80–84, 85+ years). The Gompertz function is used to provide an accurate estimate of LE for the last open-ended 85+ age interval.[111] "Life-years lived," a variable in the standard life table nomenclature, is adjusted by the measure of health-related quality of life (i.e. Health Utility Index Mark 3 [HUI3]) from CCHS data. The adjustment allows separating years spent in good health from the years spent in poor health. Years spent in good health are used to obtain HALE. Mortality estimates are based on 3 years of mortality data.
Additional notes	HALE is a measure of the average number of years that an individual is expected to live in a healthy state. A high number (years) for this indicator can be interpreted as a positive result.
29. Morbidity (Prevalence)	
Rationale	Prevalence estimates the total number of cases of disease in a population at a given time or over a given time period.[115] It is directly affected by rates of disease onset (incidence), disease progression, and survival in a population. If rates of disease incidence remain constant, prevalence rates of a disease may continue to increase in a population if people are living longer with a condition, due to better treatment and control of the condition.
Measure	Percentage of population living with chronic disease(s).
Definition	Proportion of people living with chronic disease(s) within the population during a given period. This indicator is composed of several measures that each show the prevalence of a specific chronic disease* in the population, within a given year.
Data source	Canadian Chronic Disease Surveillance System (CCDSS), Public Health Agency of Canada. Canadian Community Health Survey (CCHS), Statistics Canada
Population	The age of the population varies by disease of interest: • Population of children and youth aged 19 years and younger for diabetes, asthma and mental disorders. • Population aged 20 years and older for diabetes, heart disease, stroke, asthma, mental disorders and arthritis. • Population aged 35 years and older for COPD.
Methods of calculation	Numerator: Number of cases of a specific chronic disease* in the population at a given point in time. Denominator: Total population over a given time period.
Additional notes	*The chronic diseases included are diabetes, cardiovascular diseases (heart disease, and stroke), chronic respiratory diseases (asthma, chronic obstructive pulmonary disease [COPD]), arthritis, mental illness (all mental disorders, mood disorders and/or anxiety) and cancer (all cancers, prostate, breast, colorectal and lung cancer). In addition, the prevalence of individuals with at least 1 major chronic disease (cancer, diabetes, cardiovascular disease, chronic obstructive pulmonary disease) is measured. Estimates are calculated using both self-report data (CCHS) and administrative data (CCDSS). The prevalence of "use of service for diagnosed mental illness" is used as a proxy for mental illness prevalence. Prevalence of cancer is measured as "person-based 5-year cancer prevalence," that is, the number of individuals living with or beyond cancer that were diagnosed in the 5 years before the specified date, also known as index date. All rates presented are crude except for trends where rates are age-standardized to the 1991 Canadian population. A low rate for this indicator can be interpreted as a positive result.
30. Morbidity (Incidence Rate)	
Rationale	Incidence is a measure of the number of new cases of a disease that develop in a population over a specific time period. As a result, incidence is much more sensitive to changes over time (trends) than is prevalence.[116] Incidence rate is influenced by 2 main groups of factors: • the underlying rate of disease incidence occurrence, which reflects the prevalence of risk factors and hence the success of primary prevention efforts, and/or • the rate of disease detection and diagnosis of a specific chronic disease, which can be influenced by the intensity and effectiveness of disease screening or preventive programs.
Measure(s)	Incidence rate of chronic disease(s).*
Definition	Rate of newly diagnosed cases of a disease* per 100 000 population.
Data source	Canadian Chronic Disease Surveillance System, Public Health Agency of Canada
Population	The lower age limit of the population varies by specific disease: • Population of children and youth aged 19 years and younger for diabetes and asthma. • Population aged 20 years and older for diabetes and asthma. • Population aged 35 years and older for COPD. • Total population 0 years and older by sex for cancer.
Methods of calculation	Numerator: Number of new cases of a specific chronic disease diagnosed in the population in a particular year. Denominator: Total population at risk for the specific chronic disease in a particular year.

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30. Morbidity (Incidence Rate) [Continued]	
Additional notes	*The chronic diseases are diabetes, heart failure, ischemic heart disease, asthma, chronic obstructive pulmonary disease (COPD) and cancer (all cancers, prostate, breast, colorectal and lung cancer). All rates presented are crude except for trends where rates are age-standardized to the 1991 Canadian Population. A low rate for this indicator can be interpreted as a positive result.
31. Multimorbidity	
Rationale	Multimorbidity is the co-occurrence of more than 1 chronic disease simultaneously, where one condition isn't necessarily more central than the other. Multimorbidity is increasingly recognized as an independent predictor of disability, poor quality of life, complications of treatment, high health care costs and increased mortality.[117,118]
Measure(s)	a. Percentage of the population with multiple chronic diseases (2 or more of 10 chronic diseases), population aged 20 years and older. b. Percentage of the population with multiple chronic diseases (3 or more of 10 chronic diseases), population aged 20 years and older.
Definition	Percentage of people aged 20 years and older living with more than 1 chronic condition (2 or more or 3 or more correspondingly) within the population.
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 20 years and older.
Method of calculation	Numerator: Number of people aged 20 years and older who report 2 or more (or 3 or more) of 10 chronic diseases.* Denominator: Total population, aged 20 years and older.
Additional notes	*The chronic conditions included are: heart disease, stroke, cancer, asthma, chronic obstructive pulmonary disease (COPD), diabetes, arthritis, Alzheimer's or other dementia, mood disorder (depression), and anxiety. A low rate for this indicator can be interpreted as a positive result.
32. Disability	
Rationale	Chronic diseases may result in functional limitations that affect people's ability to perform their usual activities of daily living at home, school or work.[119,120] Short- or long-term disability has negative social impacts on a person's quality of life and ability to care of themselves or their family.[121] Disability can also have direct negative economic impacts as a result of loss of income due to time lost at work.[122]
Measure	Percentage of population who report being limited in their activities "sometimes" or "often" due to disease/illness, population aged 12 years and older.
Definition	Percentage of people aged 12 years and older who answered "sometimes" or "often" to the question "Does a long-term physical condition or mental condition or health problem reduce the amount of the kind of activity you can do at home, at work, at school, during other activities, such as transportation and leisure?"
Data source	Canadian Community Health Survey, Statistics Canada.
Population	Population aged 12 years and older.
Methods of calculation	Numerator: Number of people aged 12 years and older who report being limited in their activities "sometimes" or "often" due to disease/illness.* Denominator: Total population, aged 12 years and older.
Additional notes	*To be included in the numerator, individuals must indicate that their longer-term physical condition, mental condition or health problem is due to a chronic illness or disease or emotional/ mental condition (i.e. excludes limitations dues to ageing, accidents, birth or genetic conditions, etc.). This indicator uses activity limitation as a proxy measure for disability due to disease/illness. A low rate for this indicator can be interpreted as a positive result.
33. Cause-Specific Mortality Rate	
Rationale	Mortality rate is a widely used measure of the health of a population.[123,124] Studying patterns, rates and causes of deaths related to chronic diseases and how death varies according to different population groups can provide a measure of the long-term success in reducing deaths due to chronic diseases and insight into improvement in • social environmental conditions, • trends of underlying risk factors and • medical interventions.[125]
Measure(s)	Mortality rate due to chronic disease(s).*
Definition	This indicator measures the number of deaths from selected chronic disease(s)* per 100 000 population, in a given year.
Data source	Vital Statistics, Statistics Canada.
Population	Population aged 0 years and older.
Methods of calculation	Numerator: Number of deaths in the population from selected disease(s).* Denominator: Total population.
Additional notes	*Selected chronic disease(s): mortality rates are calculated using primary causes of death due to cardiovascular diseases, cancer, chronic respiratory diseases and suicide. Disease groups separately as well as for 3 major chronic disease categories (i.e. cardiovascular diseases, cancer and chronic respiratory diseases). All rates presented are crude except for trends where rates are age-standardized to the 1991 Canadian Census. A low rate for this indicator can be interpreted as a positive result.

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34. All-Cause Mortality Rate Ratio (Diabetes)	
Rationale	The analysis of mortality statistics based exclusively on immediate cause of death can significantly underestimate mortality attributable to other diseases that a person may have (i.e. underlying causes).[126] Diabetes mellitus is rarely recorded as the immediate cause of death on the death certificate because the people affected die of the complications of diabetes and not of the disease itself. For example, in 2007, diabetes was recorded as the main cause of death on the death certificate of only 3.1% of all deaths in Canada, even though more than one-quarter (29.9%) of all individuals who died in 2008/09 had been diagnosed with the condition.[127] All-cause mortality (the mortality rate due to any cause of death) can instead be used to estimate the all-cause mortality among people with and without diabetes independently of the immediate cause of death registered by the physician in the death certificate.
Measure	All-cause mortality rate ratio among people with and without diabetes.
Definition	The all-cause mortality rate ratio among people with and without diabetes is a measure of excess mortality associated with diabetes.
Data source	Canadian Chronic Disease Surveillance System, Public Health Agency of Canada.
Population	Population aged 20 years and older.
Method of calculation	The "mortality rate due to any cause of death among individuals who have met the criteria for diagnosed diabetes" is divided by the "mortality rate due to any cause of death among individuals who have not met the criteria for diagnosed diabetes." Numerator: Death rate among prevalent cases in the fiscal year (death rate [with diabetes]). Denominator: Death rate among individuals without diabetes in the fiscal year (death rate [without diabetes]).
Additional notes	All rates presented are crude except for trends where rates are age-standardized to the 1991 Canadian Census. A rate ratio close to one can generally be interpreted as a positive result.
35. Premature Mortality (Potential Years of Life Lost)	
Rationale	Potential Years of Life Loss (PYLL) is a widely used measure of premature mortality (early death) and is an important indicator of the general health of the population.[128] PYLL represents the total number of years not lived by people who die prematurely before reaching a given age.[129] Deaths among younger people contribute more to the PYLL measure than deaths among older people. Multiple studies suggest that premature mortality rate is a sensitive indicator of the effectiveness of measures preventing chronic diseases such as cancer and cardiovascular disease, etc.[129,130]
Measure	PYLL by cause(s) of death.
Definition	PYLL rates measure the number of years of potential life *not* lived when a person dies prematurely (i.e. before the age of 75 years) due to specific cause(s)* per 100 000 population, in a given year.
Data source	Vital Statistics, Statistics Canada.
Population	Total population.
Methods of calculation	PYLL due to death is calculated for each age group (< 1, 1–4, 5–9, ..., and 70–74) by multiplying the number of deaths by the difference between age 75 years and the mean age at death in each age group. PYLL correspond to the sum of the products obtained for each age group. The PYLL rate is obtained by dividing total PYLL by the total population aged 75 years or less.[131]
Additional notes	*Specific cause(s) of death: mortality rates are calculated using primary causes of death due to cardiovascular diseases, cancer and chronic respiratory diseases disease groups and suicide. PYLL is a measure of premature mortality in the population. All rates presented are crude except for trends where rates are age-standardized to the 1991 Canadian Census. A low rate for this indicator can be interpreted as a positive result.
36. Premature Mortality (Probability of Dying)	
Rationale	In May 2012, the World Health Assembly adopted the global target of a 25% reduction in premature mortality from non-communicable diseases (NCDs) by 2025. This is intended to reflect the impact of prevention efforts as well as improvements in access to resources that manage and treat NCDs. According to the World Health Organization, of the 57 million global deaths that occurred in 2008, about 36 million (63%) were due to NCDs, including 14.2 million premature deaths between the ages of 30 and 69 years.[132] Evidence shows that most premature deaths due to chronic disease are avoidable.[133,134]
Measure	Probability of dying (%) between the ages of 30 and 69 years from chronic disease(s).*
Definition	Premature mortality from major chronic diseases measures the unconditional probability of dying early (between the ages of 30 and 70 years) from any of 4 major chronic diseases,* expressed as a percentage.
Data source	Vital Statistics, Statistics Canada.
Population	Total population.
Methods of calculation	This indicator is calculated from age-specific death rates for each disease group as well as for the combined chronic disease categories. A life table method is used to calculate the unconditional probability of dying (q30/70) between ages 30 and 69 years from any of these causes, in the absence of other causes of death. Chiang life table method is used to calculate q30/70.
Additional notes	*Chronic disease(s): Probabilities are calculated using primary causes of death due to cardiovascular diseases, cancer, diabetes and chronic respiratory diseases, grouped separately as well as combined. Estimates for diabetes are likely underestimated as diabetes is not commonly recorded as the primary cause of death.[127] This indicator corresponds to the WHO premature mortality indicator.[135] A low rate for this indicator can be interpreted as a positive result.

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